

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Allocations and Service Rules	)	
for the 71-76 GHz, 81-86 GHz	)	
and 92-95 GHz Bands	)	WT Docket No. 02-146
81-86 GHz and 92-95 GHz Bands	)	
	)	
Loea Communications Corporation	)	RM-10288
Petition for Rulemaking	)	
	)	

**COMMENTS OF THE WIRELESS COMMUNICATIONS ASSOCIATION  
INTERNATIONAL, INC.**

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## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>ii</b>
<b>I. INTRODUCTION.....</b>	<b>1</b>
<b>II. DISCUSSION .....</b>	<b>4</b>
<b>A. ALLOCATION PROPOSALS.....</b>	<b>4</b>
1. 71-76 GHz Band .....	4
2. 81-86 GHz Band .....	7
3. 92-95 GHz Band .....	9
4. RAS Protection in the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands.....	9
<b>B. BAND PLANS .....</b>	<b>11</b>
1. 71-76 GHz and 81-86 GHz Bands.....	11
2. 92-95 GHz Band .....	12
<b>C. SERVICE RULES .....</b>	<b>13</b>
1. Unlicensed Devices in the 71-76 GHz and 81-86 GHz Bands..	13
2. Licensing Procedures.....	14
3. Coordination with Canada and Mexico.....	20
4. License Term, Renewal Expectancy and Construction Requirements.....	21
5. Forbearance from Applying Title II Regulations .....	22
<b>D. TECHNICAL RULES.....</b>	<b>23</b>
1. Regulation Under Part 101 of Commission Rules .....	23
2. Adopting Rules for Mobile Uses of the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands. ....	23
3. Specific Proposals For Technical Rules .....	25
4. Antenna Polarization .....	29
5. RF Safety.....	29
<b>III. CONCLUSION .....</b>	<b>29</b>

## EXECUTIVE SUMMARY

The Wireless Communications Association International, Inc. (“WCA”), on behalf of its Over 40 GHz Committee (the “Committee”), is very pleased to support the Commission’s *Notice of Proposed Rulemaking* in this proceeding (the “*NPRM*”), in which the Commission seeks to establish a clear and viable regulatory framework for broadband service in the 71-76, 81-86 and 92-95 GHz bands. As observed in the *NPRM* and the comments filed prior to its release, the availability of this spectrum for commercial use will trigger an unprecedented wave of innovation in millimeter wave technology, and will pave the way for the development of new, efficient broadband service in a variety of markets. The Commission is to be commended for taking swift and decisive action to make these benefits a reality for American consumers.

With respect to the 71-76 and 81-86 GHz bands (which are of the greatest interest to WCA’s members in this proceeding), the Committee agrees that the Commission’s allocation scheme should be based on the compromises agreed to at the World Radiocommunication Conference of 2000 (“WRC-2000”). The WRC-2000 model principally involves interchanging the allocations for satellite uplink services with those of satellite downlink services, so that they will not directly interfere with allocations for Radio Astronomy Services. The Committee believes that this approach will create a clearer, more administrable allocation scheme that will maximize efficient use of the spectrum for broadband applications without compromising the security of incumbent government services.

In addition, the Committee supports the Band Plan previously proposed in this proceeding by Loea Communications Corporation, under which the 71-76 GHz and 81-86 GHz bands are left unsegmented and receive equal co-primary status for authorized Federal and licensed non-Federal services. To maximize the benefits of Loea’s approach, the Committee has developed operating standards (discussed in greater detail herein) for band-edge filtering that are consistent with current Part 101 rules, and thus provide significant protection for the 86-92 GHz passive band as well as the other adjacent frequency bands. The Committee has also developed standards for antenna gain, maximum beamwidth, and sidelobe suppression, in geographical zones with and without spectral congestion, to maximize spectral reuse and sharing between Federal and non-Federal fixed and mobile users.

Finally, and perhaps most significantly, the Committee is strongly opposed to any geographic licensing of the spectrum at issue in this docket. Simply put, geographic licensing is ill-suited for spectrum in which geographic coverage is not expected to be an important feature of carrier operations. Here it must be remembered that the subject bands produce highly directional point-to-point “pencil beam” transmissions, and thus the extensive use of the bands by one entity will not preclude the use of the bands by another entity in the same geographic area. Under these circumstances, geographic licensing will artificially create spectrum scarcity or secondary markets for spectrum where none need exist. The use of a band manager would be equally problematic, as it would impose unnecessary costs on spectrum users with no corresponding benefit to the public. Instead, the Committee believes that the spectrum can and should be licensed on a site-

specific basis via use of the Commission's Universal Licensing System ("ULS"). In particular, the Committee believes it is possible to provide inputs into the ULS that will render it capable of immediately determining whether an application for a site-based link will create harmful interference, and equally capable of issuing licenses promptly for non-interfering facilities without imposing undue administrative burdens on the Commission. The Committee looks forward to working jointly with the Commission and other commenting parties to achieve this result.

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**COMMENTS OF THE WIRELESS COMMUNICATIONS ASSOCIATION  
INTERNATIONAL, INC.**

The Wireless Communications Association International, Inc. (“WCA”), on behalf of its Over 40 GHz Committee, hereby submits its comments in response to the *Notice of Proposed Rulemaking* (“NPRM”)<sup>1</sup> issued in this proceeding to allocate spectrum and adopt service and technical rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz bands.

**I. INTRODUCTION**

WCA is the trade association of the wireless broadband industry. Its membership includes a wide variety of Commission licensees, system operators, equipment manufacturers and consultants interested in the domestic deployment of spectrum for wireless broadband service. WCA has been active in virtually every major Commission proceeding relating to wireless broadband spectrum, and has assumed a leadership role in the Commission’s ongoing quest to ensure that wireless broadband service is made

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<sup>1</sup> *Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands; Loea Communications Corporation Petition for Rulemaking*, 17 FCC Rcd 12182 (2002).

available to all Americans in a reasonable and timely manner. The party who initiated proposals in the 70 GHz and 80 GHz bands which helped foster this proceeding, Loea Communications Corporation, is a member of WCA's Board of Directors, and the other wireless broadband companies who have contributed to this filing are WCA members. Accordingly, WCA has a direct and immediate interest in the Commission's creation of a regulatory and technical framework for wireless broadband service in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands.

On July 26, 2002, WCA convened a special meeting of its Over 40 GHz Committee ("the Committee"), whose membership includes senior engineering and management representatives from many of the country's leading providers of microwave and millimeter-wave wireless systems and components – Ceragon Networks, DMC Stratex, Endwave Corporation, Harmonix Corporation, Loea Communications Corporation, Millitech Corporation, and Telaxis Corporation – as well as two representatives of the Free-Space Optics (FSO) community, AirFiber and Terabeam Communications. The Committee forged a consensus as to the appropriate spectrum allocations, band plans, regulatory framework, and technical operating standards for the 71-76 GHz, 81-86 GHz and 92-95 GHz bands. The Committee's overriding goal is to achieve the objectives of the Commission's spectrum policies, *i.e.*, to encourage innovative uses of the spectrum, accommodate future developments in technology and equipment, promote competition in communications services, equipment and related markets, and permit equitable sharing between non-Federal Government and Federal Government systems. WCA is now submitting the Committee's proposals to the Commission for formal consideration in this docket.

At the outset, the Committee applauds the Commission for taking the steps necessary to establish a clear and viable set of rules for deployment of broadband service in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands. As recognized in the *NPRM*, the unique technical characteristics of these bands permit more efficient use of spectrum for point-to-point applications,<sup>2</sup> and “could stimulate new applications of radio technology, facilitate technology transfer from the military sector, and create opportunities for economic growth and jobs.”<sup>3</sup> In other words, this proceeding typifies the Commission’s commitment to fostering the development of innovative services deployed over the nation’s radio spectrum, particularly in the millimeter wave bands.<sup>4</sup> Consistent with that commitment, the Commission should adopt licensing, service and technical rules that encourage flexible use of the 71-76 GHz, 81-86 GHz and 92-95 GHz frequency bands, without imposing legacy regulations that are ill-suited for that spectrum. On this point the words of Chairman Powell bear repeating:

Today’s marketplace demands that we provide license holders with greater flexibility to respond to consumer wants, market realities and national needs without first having to ask for the FCC’s permission. I believe license holders should be granted the maximum flexibility to use – or allow others to use – the spectrum, within technical constraints, to provide any services demanded by the public. With this flexibility, service providers can be expected to move spectrum quickly to its highest and best use.<sup>5</sup>

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<sup>2</sup> *Id.* at 12185-86.

<sup>3</sup> *Id.* at 12188.

<sup>4</sup> See, e.g., *Amendment of Parts 2, 15 and 97 of the Commission’s Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, 13 FCC Rcd 15074 (1998); *Amendment of the Commission’s Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands; Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz*, 12 FCC Rcd 18600 (1997).

<sup>5</sup> “Broadband Migration III: New Directions in Wireless Policy,” Remarks of Michael K. Powell, Chairman, Federal Communications Commission, at the Silicon Flatirons Telecommunications

With few exceptions, the Committee believes that adoption of the rules proposed in the *NPRM* will bring the 71-76, 81-86 and 92-95 MHz bands to their “highest and best use.” The Committee therefore urges the Commission to act as expeditiously as possible, in accordance with the recommendations set forth herein.<sup>6</sup>

## **II. DISCUSSION**

### **A. Allocation Proposals.**

The Committee generally supports the Commission’s proposal to adopt the modified spectrum allocations devised at the World Radiocommunication Conference of 2000 (“WRC-2000”) for the 71-76 GHz, 81-86 GHz and 92-95 GHz bands. The WRC-2000 model principally involves interchanging the allocations for satellite uplink services with those for satellite downlink services, so that they will not directly interfere with allocations for Radio Astronomy Services (“RAS”). The Committee believes that this approach will create a clearer, more administrable allocation scheme that will maximize efficient use of the spectrum for broadband applications without compromising the security of incumbent government services.

#### **1. 71-76 GHz Band**

The Commission proposes to implement the WRC-92 and WRC-2000 Final Acts by consolidating satellite downlink operations in the 71-76 GHz band and eliminating the

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Program, University of Colorado at Boulder (Oct. 30, 2002) (electronic copy available at <http://www.fcc.gov/Speeches/Powell/2002/spmcp210.html>).

<sup>6</sup> The Committee is aware that the Commission’s Spectrum Policy Task Force is scheduled to release its final report shortly, and therein may address a number of regulatory and technical issues relevant to this proceeding. *See id.* Upon the release of that report, the Committee will address those issues as necessary in a subsequent filing in this docket.



earlier allocation of the 72.77-72.91 GHz band for RAS services.<sup>7</sup> More specifically, the Commission proposes to: 1) change the 71-75.5 GHz FSS directional indicator from uplink to downlink, 2) change the 71-74 GHz MSS directional indicator from uplink to downlink, 3) move the allocation for BSS feeder links from 74-75.5 GHz to 81-82.5 GHz, 4) allocate the 74-76 GHz band to the BSS and broadcasting service on a primary basis, 5) allocate the 74-76 GHz band for SRS downlinks on a secondary basis, and 6) allocate the 75.5-76 GHz band to fixed, mobile, and FSS downlink services on primary basis.<sup>8</sup> The Committee strongly supports these proposals to consolidate satellite downlink services into a single band, as they will simplify coordination with terrestrial fixed, mobile, and broadcast services.<sup>9</sup>

By the same token, however, the Committee does not believe it is necessary for the Commission to adopt a new United States footnote to the Table of Frequency Allocations specifying that “stations in the fixed, mobile and broadcasting services shall not cause harmful interference to stations of the Federal Government fixed-satellite service.”<sup>10</sup> Rather, the Commission should simply adopt technical standards for non-

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<sup>7</sup> *NPRM* at 12191-92.

<sup>8</sup> *Id.*

<sup>9</sup> The satellite industry has previously recognized the importance of implementing the compromises made at WRC-2000 where millimeter wave spectrum is concerned. *See* Comments of the Satellite Industry Association, IB Docket No. 97-95, at 2 (filed Sept. 4, 2001) (“In adopting additional rules pursuant to the *FNPRM*, the Commission’s goal should be to implement fairly the compromises made at WRC-2000, thereby promoting the development of both FSS and fixed [wireless] service operations in the affected bands. The FCC and other U.S. Government agencies worked long and hard to craft the compromises achieved at WRC-2000 concerning 40/50 GHz band (“V-band”) spectrum use. The Commission should therefore adopt proposals that facilitate the soft-segmentation model that was agreed to, and reject those proposals that would serve to upset the balance of spectrum use that is embodied in this compromise and thereby potentially re-open a potentially difficult debate.”).

<sup>10</sup> *See NPRM* at 12192.

governmental FSS and BSS services in the 74-76 GHz band that will provide adequate interference protection to government satellite operations. Specifically, the Committee recommends that the Commission adopt power-flux density (PFD) limits of  $-138$  dBW/m<sup>2</sup>/MHz at 0 to 5° declination and  $-138$  dBW/m<sup>2</sup>/MHz at 5° to 25° declination at the earth's surface, with no limits for declination angles over 25°. In addition, the Committee recommends that the Commission limit the angular elevation of fixed terrestrial services to a range of -25 to +25 degrees from the horizon. These limits will preserve for satellite users the only sightlines at high inclination that could be useful for satellite services at these frequencies, without compromising sightlines at lower inclination which are most useful for terrestrial communications. If adopted, these standards would eliminate the need for a footnote to protect future FSS and BSS use, and would thereby properly place allocations for Federal and non-Federal FSS and BSS operations on equal footing with allocations for terrestrial fixed, mobile, and broadcasting services.

Further, the Committee supports the Commission's proposal to eliminate the current RAS allocation from the 72.77-72.91 GHz band.<sup>11</sup> While the Committee recognizes the importance of RAS protection (particularly in the area of molecular line emissions, where emission spectra of scientific significance cannot be mandated or moved for convenience), the Committee agrees that the spectral line at 72.77-72.91 GHz is of minimal scientific significance, especially since it was accorded no protection under

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<sup>11</sup> *Id.* at 12191-92.

the WRC-2000 recommendation that consolidated a full 13 GHz of spectrum (81-94 GHz) for RAS.<sup>12</sup>

The Committee also recommends that the Commission adopt its proposal to eliminate the amateur and AMSAT allocations from the 75.5-76 GHz band but permit those services to operate there on a secondary basis through 2005.<sup>13</sup> As the Commission points out, it is unclear whether the amateur community is even using the 75.5-76 GHz band, and any deletion of the amateur and AMSAT allocations from the 75.5-76 GHz is mitigated by the fact that the nearby primary amateur and AMSAT allocation at 77.5-78 GHz has been available for nearly four years. Finally, the Committee urges the Commission to consider adding a Federal co-primary allocation in the 75.5-76 GHz band. Creating a new Federal co-primary status for fixed, mobile, and broadcasting services in the 75.5-76 GHz band will ensure that radios designed to utilize the entire 71-76 GHz band can provide dual use for commercial and government/military applications, thus giving new entrants the opportunity to take advantage of economies of scale.

## ***2. 81-86 GHz Band***

The Commission proposes five separate actions to consolidate satellite uplink operations in the 81-86 GHz band: 1) change the FSS directional indicator from downlink to uplink, 2) change the MSS directional indicator from downlink to uplink, 3) allocate the 84-86 GHz band for FSS uplink, 4) delete the BSS and broadcasting allocations from the 84-86 GHz band, and 5) move the BSS feeder link allocation from 74-75.5 GHz to

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<sup>12</sup> *See id.* at 12194 (“At WRC-2000, the 81-86 GHz band was allocated to the RAS on a primary basis. The addition of this RAS allocation satisfies the requirements for radio astronomy spectral line and wideband continuum observations from remote locations worldwide.”).

<sup>13</sup> *Id.* at 12192-93.

81-82.5 GHz.<sup>14</sup> The Committee strongly supports these proposals and recommends that the Commission adopt the technical standards proposed in the previous section to eliminate any prospective interference to satellite operations. The Committee also reiterates its recommendation that the Commission adopt antenna-pointing restrictions for fixed services, limiting angular elevation angles to a range between -25° and +25° relative to the horizon.

The Commission also proposes to allocate the 81-86 GHz band to the RAS on a primary basis.<sup>15</sup> Again, the Committee recognizes the importance of RAS protection, and acknowledges the efforts of WRC-2000 to consolidate 13 GHz of RAS spectrum for that purpose. The Committee therefore believes that a co-primary allocation (with terrestrial services) of 81-86 GHz for RAS is appropriate, subject to the requirement that all practical steps must be taken to protect the RAS from harmful interference when assignments to stations of other services are made. However, the Committee opposes the addition of a new secondary allocation for amateur and AMSAT services at 81-81.5 GHz.<sup>16</sup> While it is conceivable that amateur and primary commercial operations could share the band, permitting them to do so could complicate frequency coordination significantly due to potential differences in operating standards and licensing procedures. Moreover, a new secondary allocation for amateur operations at 81-81.5 appears

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<sup>14</sup> *Id.* at 12194.

<sup>15</sup> *Id.*

<sup>16</sup> *Id.* at 12194-95.

unnecessary in any case, as the existing primary amateur allocation at 77.5-78 GHz already provides sufficient bandwidth for amateur and AMSAT services.<sup>17</sup>

### **3. 92-95 GHz Band**

The Commission proposes to allocate the 92-94 GHz and 94.1-95 GHz bands to the RAS on a primary basis and to allocate the 94-94.1 GHz band to the RAS on a secondary basis, subject to the requirement that all practicable steps be taken to protect the RAS from harmful interference when assignments to stations of other services are made.<sup>18</sup> For the reasons set forth at *supra* with respect to the 81-86 GHz bands, the Committee supports this proposal.<sup>19</sup> The Committee also agrees that the FSS uplink allocations in the 92-94 GHz and 94.1-95 GHz band are no longer needed to balance the FSS allocation at 102-105 GHz, and that the FSS uplink allocation at 92-95 GHz therefore should be deleted.<sup>20</sup>

### **4. RAS Protection in the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands.**

The Commission requests comment on the extent of interference protection that should be extended to RAS operations in the 81-86 GHz, 92-94 GHz, and 94.1-95 GHz

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<sup>17</sup> It should also be noted that the Commission recently proposed to upgrade the amateur service allocation from secondary status to primary status and add a primary allocation for the AMSAT service in the 2400-2402 MHz band. *See Amendment of Parts 2 and 97 of the Commission's Rules to Create a Low Frequency Allocation for the Amateur Radio Service*, 17 FCC Rcd 8954 (2002).

<sup>18</sup> *NPRM* at 12196-97.

<sup>19</sup> The Commission also proposes to allocate the 94-94.1 GHz band to the EESS (active) and SRS (active) on a primary basis for Federal Government use (limited to cloud radars) and to delete the fixed and mobile allocations from the band. Despite the complexity of accommodating this exclusive cloud radar allocation in the center of an otherwise undisturbed 3 GHz fixed allocation, the Committee recognizes the current entrenchment of important scientific research in the band, and would support a band plan which will avoid interference with that research.

<sup>20</sup> *NPRM* at 12196.

bands.<sup>21</sup> The Committee believes that while the additional coordination required to give RAS protection in the 81-86 GHz, 92-94 GHz, and 94.1-95 GHz bands may increase costs and may at times be inconvenient, the scientific importance of maintaining a frequency frontier for RAS far outweighs those considerations. Accordingly, the Committee agrees that terrestrial wireless operations in each of the subject bands should be required to coordinate in the regions around RAS observatories, to the radial exclusion zones prescribed by the NSF.<sup>22</sup> To promote more streamlined coordination in these areas, the Commission should adopt its proposal to require RAS observatories seeking such coordination to operate a web site where fixed point-to-point licensees can input end points of links, power, and antenna characteristics, and in return receive a prompt response as to whether further coordination is necessary.<sup>23</sup> The coordination process should take into account the observatory sensitivity, terrain shielding, and the azimuth and extent of the signal propagation path relative to the observatory. The Committee also agrees with the Commission's proposal to limit RAS protection to areas outside of the one hundred most populous urbanized areas as defined by the U.S. Census Bureau.<sup>24</sup> As

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<sup>21</sup> *Id.* at 12197-98.

<sup>22</sup> In order to avoid interference to 18 RAS observatories that currently receive in the 81-86 GHz, 92-94 GHz, and 94.1-95 GHz bands, the National Science Foundation (NSF) requests that licensees of other allocated services in these bands be required to coordinate with these RAS sites. NSF states that coordination radii on the order of 150 kilometers (93 miles) around the 8 single dish observatories and 25 kilometers (15.5 miles) around the 10 Very Long Baseline Array (VLBA) stations appear to be sufficient to ensure protection of these RAS facilities.

<sup>23</sup> *NPRM* at 12198-99. RAS data should also be incorporated into the Commission's Universal Licensing System or a third party coordinator's database (depending on the licensing scheme ultimately chosen by the Commission in this docket), to ensure that RAS facilities are fully accounted for during the process of determining whether links in the subject spectrum will cause harmful interference.

<sup>24</sup> *Id.* at 12199.

the Commission points out, this limitation would facilitate commercial deployment in those areas where spectrum demands are most intense.

## **B. Band Plans**

### ***1. 71-76 GHz and 81-86 GHz Bands***

The Committee supports the Band Plan previously proposed in this proceeding by Loea Communications Corporation (the “Loea Band Plan”), under which the bands 71-76 GHz and 81-86 GHz are left unsegmented and receive equal co-primary status for authorized Federal and licensed non-Federal services.<sup>25</sup> The Committee believes that the Loea Band Plan should be adopted in conjunction with the Committee’s proposed technical rules, which generally follow the existing Part 101 regulatory framework.<sup>26</sup> In particular, the Committee has developed operating standards for band-edge filtering that are consistent with current Part 101 rules, and thus provide significant protection for the 86-92 GHz passive band as well as the other adjacent frequency bands. The Committee has also developed standards for antenna gain, maximum beamwidth, and sidelobe suppression, in geographical zones with and without spectral congestion, to maximize spectral reuse and sharing between Federal and non-Federal fixed and mobile users.<sup>27</sup>

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<sup>25</sup> *Id.* at 12203.

<sup>26</sup> *See* Section II.D, *infra*. The full text of the Committee’s proposed rule revisions is set forth in Appendix A hereto.

<sup>27</sup> Further, as discussed in Section II.A.1 and A.2 *supra*, the Committee has developed additional beam pointing standards restricting beam elevation angles, which will permit equitable sharing with satellite downlink operations.

## **2. 92-95 GHz Band**

The Commission identifies three candidate band plans for the 92-95 GHz band, designated Band Plans I, II, and III.<sup>28</sup> The Committee supports adoption of Band Plan III because it provides the largest single contiguous slice of bandwidth and the greatest equity for Federal and non-Federal users. While Band Plan I provides a useful solution for broadband full-duplex receivers using separate frequency channels for transmitting and receiving, the Committee believes that any further subdivision of the 900-MHz channels as proposed in Band Plan I would be unproductive and potentially damaging to broadband technology opportunities because of the inefficiency introduced by guard bands, and the added complexity of modulation schemes utilizing multiple frequency channels.<sup>29</sup> Moreover, as discussed in subsection C.1 *infra*, while the Committee is generally supportive of license-exempt operations, it remains concerned that coexistence of licensed and unlicensed devices in the same frequency space in the bands at issue here could cause interference problems in dense deployments.<sup>30</sup> The Committee also believes that Band Plan II is least optimal for full duplex communications using separate transmitting and receiving channels, since the narrower separation between channels increases phase noise and makes band-edge filtering more difficult.

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<sup>28</sup> *NPRM* at 12200.

<sup>29</sup> Band Plan I plan clearly favors commercial users over Federal users in terms of quality and quantity of spectrum, but for all practical purposes it puts a Federal secondary allocation on nearly the same footing as a primary allocation, due to the extremely remote possibility of interference from narrow-beam deployments in the subject bands.

<sup>30</sup> As an alternative to authorizing unlicensed devices, the Commission could adopt Part 101 licensing rules with reduced power levels in the 92.0-92.3 GHz and 94.0-94.1 GHz bands, to minimize the possibility of interference with passive band operations and cloud radar systems.



## C. Service Rules

### 1. *Unlicensed Devices in the 71-76 GHz and 81-86 GHz Bands*

The Commission proposes to adopt Part 15-like service rules for the unlicensed channels in its recommended 92-95 GHz Band Plan (Band Plan I), similar to those it has already adopted for license-exempt operations in the 57-64 GHz band.<sup>31</sup> The Commission also seeks comment on whether it should permit Part 15 license-exempt operations in the 71-76 and 81-86 GHz bands.<sup>32</sup>

As a general matter, the Committee fully appreciates the role Part 15 operations play in delivering broadband service to the public, both independently and in tandem with licensed services.<sup>33</sup> For the bands at issue here, however, the Committee believes that the coexistence of licensed and license-exempt services poses a difficult and perhaps intractable problem for band coordination.<sup>34</sup> This is significant, since it is anticipated that these bands will be used for high-speed transmissions of data and video for critical business and other applications requiring significant service level (including up-time)

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<sup>31</sup> *NPRM* at 12206.

<sup>32</sup> *Id.*

<sup>33</sup> As the Commission is aware, WCA founded the License-Exempt Alliance, a nationwide coalition of service providers, equipment vendors, consultants and others interested in the deployment of license-exempt spectrum for broadband service. *See also* “Unlicensed Spectrum Success – Lessons for the Next Chapter in FCC Spectrum Management,” Remarks of Commissioner Kathleen Q. Abernathy, San Diego Telecom Council, San Diego, CA (July 18, 2002) (“The Commission is well served by utilizing both the property-like rights approach and the commons model. Just as a city has private land linked together by common roads and parks – so too may the spectrum community enjoy and fully utilize both private property and the commons. Indeed, if recent successful experiences with the unlicensed bands hold true, it may be that unlicensed operations are the roads that connect the private property of licensed spectrum holders into a continuous broadband spectrum web.”).

<sup>34</sup> To date, the record before the Commission in this proceeding does not indicate that the license-exempt community has a substantial interest in the subject spectrum.

guarantees. As a result, service providers will require substantial certainty that their operations will not receive harmful interference from others (hence the need for permitting only licensed operations). Further, segmentation of the 71-76 GHz and 81-86 GHz bands should not be employed as a means to solve this coordination difficulty, as band segmentation ultimately limits the capacity of broadband wireless services.<sup>35</sup> For that reason, the Committee opposes the Commission's proposal to segment the 92-95 GHz band into separate licensed and unlicensed channels, as this would unduly limit the communications speeds that can be achieved for digital data communications in the band. The Committee believes that the wide contiguous slice of spectrum from 57-64 GHz easily provides adequate bandwidth for license-exempt operations.

## ***2. Licensing Procedures***

The Commission has asked for comments on what licensing procedures would be appropriate for the 71-76 GHz, 81-86 GHz and 92-95 GHz bands. In particular, the Commission seeks input on the possibility of using geographic licensing (and presumably the use of competitive bidding), except in certain circumstances where coordination with Federal government operations may be necessary.<sup>36</sup> For the reasons set forth below, the Committee believes that the subject spectrum can and should be licensed on a site (path) specific basis via use of the Commission's Universal Licensing System ("ULS"), which would be programmed to evaluate applications for regulatory compliance and issue authorizations for this spectrum. Although it is not the Committee's preferred alternative,

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<sup>35</sup> See Final Report: Spectrum Study of the 2500-2690 MHz Band, The Potential for Accommodating Third Generation Mobile Systems, FCC at p. 86 (rel. Mar. 30, 2001) (discussing impact of band segmentation on wireless broadband service in the 2.5 GHz band).

<sup>36</sup> *NPRM* at 12206-07.

the Committee also believes it could be feasible to utilize third party coordinating entities to evaluate applications for compliance with the Commission's rules before they are submitted to the ULS. Similarly, the Committee would also support the issuance of "blanket" nationwide licenses, if they are conditioned on each licensee's coordination of each of its links through a third-party coordinator.<sup>37</sup>

The Commission has cited three fundamental benefits of geographic licensing: 1) it affords licensees substantial flexibility to respond to market demand; 2) it allows licensees to coordinate use of spectrum across a broad geographic area; and 3) it allows licensees to adjust spectrum usage based on market demands.<sup>38</sup> Geographic licensing has been especially beneficial to, for example, the mobile wireless services, since it allows them to relocate base station facilities and spectrum without prior Commission approval.<sup>39</sup> This sort of flexibility is necessary to ensure that mobile carriers are able to reach consumers within a broad geographic area, a critical feature of mobile wireless

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<sup>37</sup> The Committee believes that the public interest in the rapid deployment of this millimeter wave technology for broadband service militates strongly in favor of Commission rules that minimize any licensing or coordination fee for the subject bands.

<sup>38</sup> *Id.* at 12207.

<sup>39</sup> See, e.g., *Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems*, 12 FCC Rcd 2732, 2739 (1997) ("Paging Order") (adopting geographic area licensing for paging operations because it "provides flexibility for licensees and ease of administration for the Commission, facilitates further build-out of wide-area systems, and enables paging operators to act quickly to meet the needs of their customers."); *Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band; Implementation of Sections 3(n) and 322 of the Communications Act – Regulatory Treatment of Mobile Services; Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, 12 FCC Rcd 19079, 19087 (1997) (adopting geographic licensing for the lower SMR bands because "[g]eographic area licensing . . . increase[s] the flexibility afforded to licensees to manage their spectrum . . . [and] reduce[s] administrative burdens and operating costs by allowing licensees to modify, move, or add to their facilities within specified geographic areas without need for prior Commission approval.").

service.<sup>40</sup> The Commission has also used geographic licensing in other wireless services where wide-area coverage is deemed to be important.<sup>41</sup> In these cases, the common feature of the services at issue was the fact that use of spectrum in a geographic area by one entity effectively precludes the use of the same spectrum in the same geographic area.

By contrast, the use of geographic area licensing is not appropriate in the bands at issue here, where scope and ubiquity of geographic coverage is not expected to be an important feature of either carrier or private entity operations and where the use of spectrum by one entity in a geographic area very rarely precludes the re-use of that spectrum by another entity. As the Commission notes, these bands produce highly directional point-to-point “pencil beam” transmissions.<sup>42</sup> Consequently, the extensive use of the bands by one entity will not preclude the use of the band by another entity in the same geographic area. Because use of the bands by more than one entity in a geographic area is feasible, geographic area licensing is neither desirable nor appropriate.

Indeed, if the Commission adopts a geographic area licensing approach for the subject bands, it will artificially create spectrum scarcity or secondary markets for spectrum where none need exist. Because a single entity is unlikely to need access to the spectrum throughout an entire geographic area, a geographic area licensee will be required to engage in partitioning or disaggregation (assuming it is permitted) for the

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<sup>40</sup> 2000 Biennial Regulatory Review--Amendment of Part 22 of the Commission's Rules to Modify or Eliminate Outdated Rules Affecting the Cellular Radiotelephone Service and other Commercial Mobile Radio Services, 17 FCC Rcd 18485, ¶ 8 (2002) (noting “the market demand for nationwide, ubiquitous coverage by [wireless] carriers”).

<sup>41</sup> See, e.g., *Amendment of the Commission's Rules Concerning Maritime Communications*, 13 FCC Rcd 19853 (1998) (“VPC Order”) (adopting geographic area licensing of VHF public coast stations).

<sup>42</sup> *NPRM* at 12206-07.

spectrum to achieve its highest and best use. If, however, the Commission simply permitted site-specific licensing of the spectrum, it would spare potential licensees the transaction costs that necessarily arise from using spectrum on a partitioned or disaggregated basis.

Equally problematic is the concept of using band-manager licensing in this context. Assuming that band managers would be required to obtain their authorizations through competitive bidding, they would be motivated to at least recapture the costs of obtaining their authorizations, and at most profit from the management of the spectrum. While this approach may provide coordination benefits (*i.e.*, allowing multiple entities to utilize the spectrum potentially in the same geographic area), it would impose unnecessary costs on spectrum users.<sup>43</sup> As explained below, the same results – the use of spectrum in the same area by different users – can be achieved by means that do not impose burdens on spectrum users.

First, it is possible to develop industry standards that can predict with little analysis when a proposed path may cause interference to an existing path. At the same time the ULS has become increasingly sophisticated, to the point where it permits the nearly automatic processing of certain types of applications.<sup>44</sup> The Committee therefore recommends that the Commission develop appropriate technical standards that would

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<sup>43</sup> See *Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended; Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies; Establishment of Public Service Radio Pool in the Private Mobile Frequencies Below 800 MHz; Petition for Rule Making of The American Mobile Telecommunications Association*, 15 FCC Rcd 22709, 22727 (2000) (noting that “band managers would be able to charge private users for spectrum use”).

<sup>44</sup> Most applications for renewal, for example, are submitted electronically in the ULS, processed without material FCC intervention, and granted in due course. See “FCC Universal Licensing System,” available at <http://wireless.fcc.gov/uls>.

predict, using only a limited number of parameters (geographic coordinates, antenna height above ground, antenna orientation, etc.) to determine whether proposed operations would interfere with a previously licensed system.<sup>45</sup> Those technical standards would be included in the ULS processing system – in turn, licensees would be required to apply electronically for authorizations, and the ULS system would be equipped to automatically evaluate whether a proposed link is acceptable, using the industry-accepted interference criteria. If the proposed link were deemed acceptable, the ULS would permit the applicant to continue the licensing process and would ultimately authorize the desired link upon receipt of the required application fee and, if necessary, lapse of the thirty (30) day period required by Section 309 of the Act.<sup>46</sup> If the proposed link were unacceptable, the ULS would be programmed to notify the applicant of the co-channel station or application that prevented the authorization of its proposed facility.<sup>47</sup>

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<sup>45</sup> The Committee believes that it may be possible to develop such standards via negotiation with other commenting parties in this proceeding. Accordingly, the Committee intends to pursue this option once all initial comments on the *NPRM* are filed, and will offer a joint proposal to the Commission on this issue if a consensus with those commenting parties can be achieved.

<sup>46</sup> Applicants would be required to designate their regulatory status. If licensees proposed to provide a common carrier service, the Commission would be required, pursuant to Section 309 of the Act, to reference the submission of the application on a public notice and wait thirty (30) days before the issuance of a license. For non-carriers, authorizations could be issued immediately upon receipt of the application fee. 47 U.S.C. § 309(b).

<sup>47</sup> As suggested above, the Committee also believes that the ULS should be programmed to predict whether interference would occur to RAS facilities. In addition, the Committee recognizes that in some instances Federal government facilities would prevent the authorization of proposed facilities. *NPRM* at 12207-08 (noting that “that the 71-76 GHz, 81-86 GHz and 92-95 GHz bands are allocated to Federal Government services on a co-primary basis.”). The Committee recommends that the information necessary to protect the Federal government facilities be included in the Commission’s database so that the ULS system can evaluate whether a proposed system will cause unacceptable interference to a Federal government station. If harmful interference is predicted, the ULS would not identify the operating parameters of the Federal government system, as it might for privately licensed systems. Instead, the ULS will simply state that the proposed operations are prevented by use of the desired spectrum by Federal government operations.

Alternatively, if the Commission does not believe that the ULS can be designed to evaluate whether proposed systems in the subject spectrum are likely to cause harmful interference, the Committee believes it would be feasible to use a private third party entity or entities to accomplish that objective. The Committee recommends two possible approaches if the Commission chooses this option. First, the third party entities could be required to certify that their evaluation of applications would be in strict accordance with the Commission's rules and any relevant industry guidelines. Applications submitted by such entities that included the appropriate certifications would then be submitted via the ULS and processed pursuant to the procedures described above.<sup>48</sup>

Second, the third party entities could act in the second of two steps in the licensing process to coordinate paths. Under this plan, the Commission would first issue a nationwide blanket authorization for any entity that desired to utilize the band. Such a nationwide license would not actually permit operation of any particular transmission link. Instead, subsequent to Commission grant of a "blanket" nationwide license, an applicant would be required to obtain a certification through a third party for the use of a particular link, based on the third party's determination that the link would comply with

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<sup>48</sup> The Commission often uses third party entities in the authorization processes. In Parts 90 and 101 of its rules, the Commission contemplates the submission of evidence of frequency coordination with most applications. See 47 C.F.R. §§ 90.175, 101.103. Further, the Commission has used third party entities to approve the use of devices under Part 68 of the rules, and has authorized so-called Telecommunications Certification Bodies ("TCBs") to evaluate the use of products subject to the equipment approval process. See *2000 Biennial Regulatory Review*, 16 FCC Rcd 1207, 1215 (2001) (privatizing the standards development and terminal equipment approval processes); *2000 Biennial Regulatory Review of Part 68 of the Commission's Rules and Regulations*, 15 FCC Rcd 24944, 24956-57 (2000) (requiring industry to establish a committee to develop technical criteria). The Commission has also permitted third parties to issue Maritime Mobile Service Identities ("MMSIs") in the maritime services. See *Amendment of Part 0 of the Commission's Rules to Delegate Authority to the Wireless Telecommunications Bureau Concerning Procedures for Assigning Domestic Maritime Mobile Service Identities*, 14 FCC Rcd 21517 (1999); "Commission Announces Revision of Procedures for Assigning Maritime Mobile Service Identities," *Public Notice*, 16 FCC Rcd 918 (2001).

the Commission's rules and any relevant industry guidelines. This approach is similar to the Commission's authorization process for train control systems in the 900 MHz band.<sup>49</sup> In that instance, the Commission recognized the need to craft rules that reflected the particular technical characteristics of the frequency band and the interests of licensees and the public, and thus amended its rules to shift from a case-by-case licensing approach to blanket licensing.<sup>50</sup>

### **3. Coordination with Canada and Mexico**

The Commission has reminded all interested parties that operations in the 71-76 GHz, 81-86 GHz, and 92-95 GHz bands must not cause harmful interference across the Canadian and Mexican borders.<sup>51</sup> While the Committee agrees that cross-border interference should be avoided, at this time it is unaware of any services in Canada or Mexico that use any of the specified bands. Hence, in the event that interference arises from unintentional or deliberate signal transmissions across the Canadian or Mexican

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<sup>49</sup> See, e.g., Petition of Association of American Railroads (AAR) for Modification of Licenses For Use In Advanced Train Control Systems and Positive Train Control Systems, *Order*, 16 FCC Rcd 3078 (WTB 2001) ("*AAR Order*").

<sup>50</sup> *Id.* at 3082-83. The Commission states two concerns about using a private third party to evaluate applications. First, the Commission suggests that alleged that even though the use of third parties would alleviate administrative burdens on the agency, it would still impose excessive costs on licensees. *NPRM* at 12208. The Committee believes that these cost burdens can be ameliorated, particularly by close cooperation between industry groups such as WCA and coordinating entities. Moreover, whatever these cost burdens may be, they will less onerous than those associated with the secondary market inefficiencies of the geographic licensing or band manager approaches, or the uncertainty of using license-exempt spectrum. Second, the Commission suggests that a third party would be required to function in accordance with the technical licensing criteria codified in the FCC's rules and that any change in criteria would require the initiation of a rulemaking proceeding. *Id.* Because licensees already function effectively within those criteria in other contexts, there is no reason to believe that they will not be able to function equally well in the bands at issue here. In any case, even where the technical criteria must be changed, the unavoidable delays associated with the rulemaking process remain preferable to the avoidable burdens associated with alternative licensing mechanisms, or no licensing at all.

<sup>51</sup> *NPRM* at 12214.



borders in the subject bands, the Committee recommends that the offending service provider be governed under the more restrictive of the U.S. or foreign regulations regarding emissions in and out of those bands.

**4. *License Term, Renewal Expectancy and Construction Requirements.***

The Committee supports the Commission's proposal to adopt a ten-year license term for each license in the subject bands, with an expectancy of renewal for applicants who have provided substantial service during its past license term and who have complied with the Communications Act and applicable Commission rules and policies. There is ample precedent for this approach, since the Commission has already adopted the very same requirement for, among others, 24 GHz and 39 GHz licensees governed by Part 101.<sup>52</sup> Furthermore, the public interest basis for this approach is well-established: "Compared to a construction standard, a substantial service requirement will provide licensees greater flexibility to determine how best to implement their business plans based on criteria demonstrating actual service to end users, rather than on a showing of whether a licensee passes a certain proportion of the relevant population."<sup>53</sup>

The Commission also seeks comment on appropriate construction and/or minimum coverage requirements for licensees in the 71-76, 81-86, and 92-95 GHz bands. For the 71-76, 81-86, and 92-95 GHz bands, the Committee believes that each site based license should include a condition providing that once a licensee obtains approval either

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<sup>52</sup> See *Amendments to Parts 1, 2, 87 and 101 of the Commission's Rules To License Fixed Services at 24 GHz*, 15 FCC Rcd 16934, 16952-53 (2000).

<sup>53</sup> See *Amendments to Parts 1, 2, 27 and 90 of the Commission's Rules to License Services in the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, and 2385-2390 MHz Government Transfer Bands*, 17 FCC Rcd 9980, 10011 (2002).

directly from the Commission or from the third-party coordinator for any individual path, it must complete construction of that path within 6 months. While the Committee recognizes that the standard construction period for site-based Part 101 licenses is 18 months,<sup>54</sup> it believes that a shorter period is necessary to keep licensees from arbitraging high-value paths, *e.g.* Empire State Building to Chrysler Building.

### **5. *Forbearance from Applying Title II Regulations***

The Commission seeks comment on whether to forbear from applying certain obligations on common carrier licensees in the 71-76 GHz, 81-86 GHz and 92-95 GHz bands pursuant to Section 10 of the Act.<sup>55</sup> The Committee urges the Commission to do so - in an era of flexible use where CMRS carriers are permitted to provide fixed wireless services and vice-versa,<sup>56</sup> there does not appear to be any reason for the Commission to retain its archaic distinction between the two where regulatory forbearance is concerned, particularly give the size of wireless broadband's market share relative to that of cable modem and DSL services.

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<sup>54</sup> See C.F.R. § 101.63(a).

<sup>55</sup> See *NPRM* at 12217.

<sup>56</sup> See, *e.g.*, *Amendment of the Commission's Rules to Permit Flexible Service Offerings in the Commercial Mobile Radio Services*, 11 FCC Rcd 8965 (1996); *Amendment of Part 2 of the Commission's Rule to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services*, 16 FCC Rcd 17222(2001) (authorizing use of MDS/ITFS channels in the 2.5 GHz band for fixed and mobile services).

## **D. Technical Rules**

### ***1. Regulation Under Part 101 of Commission Rules***

The Commission seeks comment on the overriding issue of whether it should regulate primary fixed uses in the 71-76, 81-86, and 92-95 GHz bands pursuant to Part 101 Rules, as it has traditionally done for fixed point-to-point microwave operations.<sup>57</sup>

The Committee strongly supports the use of the Part 101 regulatory framework for fixed uses in the 71-76, 81-86, and 92-95 GHz bands. The adoption of Part 101 licensing, with appropriate power and beamwidth restrictions on transmitters in the bands, and without unnecessary partitioning of frequency bands, is the best way to accomplish this goal. Moreover, the expectation of priority rights that comes with licensed spectrum will facilitate access to investment capital for businesses seeking to develop, deploy, and/or utilize technology in these bands.

### ***2. Adopting Rules for Mobile Uses of the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands.***

The Commission notes that although this spectrum is allocated for fixed and mobile services, mobile operations were not addressed in the petition or comment stages leading up to the *NPRM*.<sup>58</sup> Thus the Commission requests comment on whether it would be appropriate to establish rules to regulate mobile operation in the spectrum and to propose specific technical and operational rules for mobile service.

The Committee believes that a significant objective of this proceeding is to establish fixed service rules which will not impede potential future uses of the band, including mobile, satellite, and radio astronomy applications. Such protective rules

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<sup>57</sup> See *NPRM* at 12219.

<sup>58</sup> *Id.* at 12220.

include coordination requirements with RAS facilities and antenna pointing requirements for protection of satellite services. The Committee does not feel, on the other hand, that it is prudent or necessary to develop specific regulations and standards for these other services at this time, especially since many of these future services have not been well defined or in some cases even yet conceived, and are not likely to be represented by respondents to this *NPRM*.<sup>59</sup>

Furthermore, millimeter wave and other line-of-sight technologies have a short effective range in ground-based mobile applications because of occlusions at ground level. Technology such as collision-avoidance radar at 77 GHz is a case in point, where it is precisely these occlusions that provide the data of interest. Given the existence of the 77 GHz allocation for radiolocation, the 71-76, 81-86, and 92-95 GHz bands should not be needed for this application. Ground-based mobile communications applications could conceivably arise with the advent of “smart highways” and other applications whereby automobiles would communicate with other automobiles and with objects on and nearby the road. The short-range nature of these communications makes the Part 15 band at 57-64 GHz the most appropriate candidate for new technology in these applications. The only mobile applications that would have a line-of-sight expectation of greater than 1 mile (i.e. 70/80 GHz rather than 60 GHz applications) would involve ground-to-air, ground-to-space, air-to-air, or air-to-space links. Thus the exclusion of mobile operations at less than 25 degrees inclination or declination does not unduly restrict the usefulness of the 71-76, 81-86, and 92-95 GHz bands. In this case the

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<sup>59</sup> See *Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands: Implementation of Section 309(j) of the Communications Act -- Competitive Bidding*, 37.0-38.6 GHz and 38.6-40.0 GHz, 12 FCC Rcd 18600, 18615 (1997) (deferring mobile rules for 39 GHz band pending further technical study).

necessary coordination will be with satellite users, not with fixed services that are restricted (as proposed) to elevation angles less than  $\pm 25$  degrees. Clearly, such mobile-satellite coordination is a topic for the future and not appropriate for this proceeding.<sup>60</sup>

### **3. Specific Proposals For Technical Rules**

#### **a. Channelization Plan**

The Committee applauds the Commission's suggestion that it intends to leave the 71-76 and 81-86 GHz bands fully contiguous and without segmentation.<sup>61</sup> Based on market experience and current trends, the Committee believes that future licensees will need access to the entire spectrum in order to obtain the very high throughput they will need to provide fiber-like services. Further, channelization is unnecessary because the rules on beamwidth and power proposed herein allow nearly infinite reuse of the spectrum. As to the 92-95 GHz band, the Committee prefers adoption of Band Plan III as discussed *supra*, which segments the band to the minimum extent necessary while protecting the 94.0-94.1 GHz cloud radar band.

#### **b. Interference Protection Criteria**

The Commission proposes that in the event that geographical area licensing is adopted for any or all of the 71-76 GHz, 81-86, and 92-95 GHz bands, additional interference protection criteria could be adopted to ensure cooperation among licensees to minimize and resolve potential interference problems.<sup>62</sup> For those who support a site-by-

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<sup>60</sup> Ship-to-ship and ship-to-shore operations comprise a special case where no water-level occlusions may be expected, and range to horizon is typically limited to 10 miles or less. A simple addition to the fixed and mobile services rules would establish a 10-mile boundary at the coastline, within which terrestrial cross-border coordination rules are applied, and outside of which, the exclusion of mobile operations below 25 degrees inclination or declination is waived.

<sup>61</sup> See *NPRM* at 12220.

<sup>62</sup> *Id.* at 12220-21.

site licensing approach, the Commission requests comment on whether any criteria from Section 101.105 of the rules could be applied.<sup>63</sup>

As discussed above, the Committee is strongly opposed to the use of geographical area licensing and to band segmentation in the 71-76 GHz and 81-86 GHz frequency bands. The Section 101.105 rules apply to co-channel and adjacent channel interference in segmented bands at lower frequencies and thus are not suitable for unsegmented bands. As an alternative, the Committee proposes that existing rules on band-edge filtering be enforced to protect users in adjacent bands. Band-edge filtering is a more appropriate means of regulating transmissions in the bands at issue here, as the tight pencil-beam transmissions proposed herein can in principle give hardware manufacturers considerable flexibility in choosing carrier frequencies and channel bandwidths appropriate to their technology niches. Accordingly, the Committee proposes that the Commission simply enforce its rules on band-edge filtering listed in section 101.111(a)(2)(ii), *i.e.*, that in any 1 MHz band, the center frequency of which is removed from the assigned center frequency by a percentage P of more than 50 percent up to and including 250 percent of the authorized bandwidth B, the minimum radiation suppression A, in dB, is less than  $A = 11 + 0.4(P - 50) + 10 \log_{10} B$ , or  $A = 56$ , whichever is smaller.

***c. Restrictions on Total Radiated Power and Antenna Directionality***

The Commission seeks comment on whether an EIRP limit of +55 dBW is appropriate for the bands 71-76 GHz, 81-86 GHz, and 92-95 GHz.<sup>64</sup> The Committee feels that an EIRP limit of +55 dBW, commensurate with EIRP limits of several other

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<sup>63</sup> *Id.*

<sup>64</sup> *Id.* at 12221-22.

Part 101 regulated fixed service bands above 20 GHz, is high enough to allow broadband communications transceivers to reach meaningful line-of-sight distances (1 to 10 miles), but not so high as to cause undue interference.

The Committee has developed standards for antenna gain and directionality. These standards call for a footnote to Section 101.115 for the 71-76 and 81-86 GHz bands, to the effect that antenna gain of less than 50 dB will be permitted, with a proportional reduction in maximum authorized transmitter power in a ratio of 2 dB of power per 1 dB of gain. This will reduce the maximum allowable EIRP (in dBW) for antennas of less than 50 dBi gain to  $+55 - 3 ( 50 - G )$ , where G is the antenna gain in dBi. A second footnote increases the authorized beamwidth in degrees for antennas with gain of less than 50 dBi to  $0.60 \cdot 10^{(50-G)/20}$ .

The Committee has also developed a table for minimum radiation suppression as a function of angle from the centerline of the main beam, which is revised from the table included in Loea's Petition for Rulemaking. This table results from calculated exclusion zones of potential interference around transmitters, with suppression values set such that, assuming 20 dB of cross-pol rejection, interference can always be resolved by moving one antenna by a distance of 17 meters or less (1° exclusion zone) at a 1 km separation. The table below includes by footnote a new column for radiation suppression between 1° and 5° of the main beam in zones of frequency congestion, as follows:

Frequency (MHz)	Maximum beamwidth to 3 dB points  (Included angle in Cat degrees)	Minimum  antenna gain (dBi)	Minimum radiation suppression to angle in degrees from centerline of main beam in decibels							
			5°	10°	15°	20°	30°	100°	140°	
			to 10°	to 15°	to 20°	to 30°	to 100°	to 140°	to 180°	
71,000 to 76,000	A 0.60†	50‡	*L <sub>1</sub>	36	40	45	50	55	55	55
	B 0.60†	50‡		33	36	39	42	45	45	45
81,000 to 86,000	A 0.60†	50‡	*L <sub>1</sub>	36	40	45	50	55	55	55
	B 0.60†	50‡		33	36	39	42	45	45	45

† For antenna gain < 50 dBi, maximum authorized beamwidth in degrees increases to  $0.60 * 10^{(50 - G) / 20}$ , subject also to added constraints on power described below.

‡ Antenna gain less than 50 dBi is permitted with a proportional reduction in maximum authorized transmitter power in a ratio of 2 dB of power per 1 dB of gain, so that the maximum allowable EIRP (in dBW) for antennas of less than 50 dBi gain becomes  $+55 - 3 (50 - G)$ , where G is the antenna gain in dBi.

\*For the bands 71-76 GHz and 81-86 GHz, in zones of frequency congestion, the following specification is included for minimum radiation suppression L<sub>1</sub> at angles from 1° to 5° from centerline of main beam in dB:  $30 + (1 / 2) (G - 50)$ ;  $G \geq 50$  dBi;  $30 + (12 / 7) (G - 50)$ ;  $G < 50$  dBi. The Commission recognizes that high levels of radiation suppression are difficult to achieve so close to the main beam, and agrees to allow a variance from this standard in return for a proportional reduction in transmitter power, in a ratio of 2 dB per dB of suppression variance:  $EIRP = +55 - 2 (L_1 - L)$ . This power reduction is in addition to any reduction that may apply independently for antennas with gain of less than 50 dBi.

The Committee does not wish to impose undue requirements on hardware providers to certify every antenna by measurement, but proposes instead to accept a probable radiation suppression level L for a class of antennas based on 9 of 10 antennas meeting or exceeding this value on measurements of ten random samples from a single production run.



#### **4.     *Antenna Polarization***

Although the Commission does not discuss restricting antenna polarization, the Committee raises the issue here because it has determined that mandating linear antenna polarization for fixed services will give a frequency coordinator an important tool for coordinating links in an environment of frequency congestion. Circularly polarized transmitters used together with linearly polarized transmitters cannot achieve the high levels of cross-pol rejection that may enable higher density technology deployments. The Committee expects that future mobile and satellite deployments will make use of circularly polarized beams.

#### **5.     *RF Safety***

The Commission proposes that licensees and manufacturers in the 71-76, 81-86, and 92-95 GHz bands be subject to the RF radiation exposure requirement requiring a routine environmental evaluation if the ratio  $4P/A$  is greater than  $1 \text{ mW/cm}^2$ , where  $A$  is the area of the antenna in  $\text{cm}^2$  and  $P$  is the power of the transmitter in  $\text{mW}$ .<sup>65</sup> The Committee recognizes the importance of health safety and supports the requirement in the form proposed, even though in many cases it is more restrictive than the EIRP limit proposed above.

### **III.   CONCLUSION**

In sum, the *NPRM* establishes a viable, comprehensive blueprint for regulation and deployment of broadband facilities in the 71-76, 81-86 and 92-95 GHz bands. Combined with the technical and licensing proposals in these comments, the rules proposed in the *NPRM* will, in the words of Chairman Powell, “free spectrum from its

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<sup>65</sup> See *NPRM* at 12222-23.

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## **APPENDIX A**

## PROPOSED DEFINITIONS AND RULES

The Commission proposes to amend 47 CFR Parts 2, 15, 97, and 101 as follows:

### PART 2 -- FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

Section 2.106, the Table of Frequency Allocations, is amended as follows:

- a. Revise pages 81 through 83.
- b. In the list of International Footnotes, under I., revise footnotes 5.149, 5.556, and 5.561; and add footnotes 5.559A, 5.560A, 5.561A, and 5.562A.
- c. In the list of United States (US) Footnotes, revise footnotes US211, US297, and US342; remove footnote US270; and add footnotes USwww, USxxx, USyyy, and USzzz.

#### § 2.106 Table of Frequency Allocations

##### INTERNATIONAL FOOTNOTES

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USzzz In the bands 81-86 GHz, 92-94 GHz, and 94.1-95 GHz, the radio astronomy service shall not receive protection from other allocated services, except within the maximum coordination distances listed for the following radio astronomy observatories.

Telescope and site	150 kilometer (93 mile) radius centered on:	
	North Latitude	West Longitude
National Radio Astronomy Observatory (NRAO), Robert C. Byrd Telescope, Green Bank, WV	38° 25' 59"	79° 50' 24"
NRAO, Very Large Array, Socorro, NM	34° 04' 44"	107° 37' 06"
University of Arizona 12-m Telescope, Kitt Peak, AZ	31° 57' 10"	111° 36' 50"
BIMA Telescope, Hat Creek, CA	40° 49' 04"	121° 28' 24"
Caltech Telescope, Owens Valley, CA	37° 13' 54"	118° 17' 36"
Five Colleges Observatory, Amherst, MA	42° 23' 33"	72° 20' 40"
Haystack Observatory, Westford, MA	42° 37' 23"	71° 29' 19"
James Clerk Maxwell Telescope, Mauna Kea, HI	19° 49' 33"	155° 28' 20"
NRAO, Very Long Baseline Array Stations	25 kilometer (15.5 mile) radius centered on:	
	North Latitude	West Longitude
Brewster, WA	48° 07' 52"	119° 41' 00"
Fort Davis, TX	30° 38' 06"	103° 56' 41"
<b>HANCOCK, NH</b>	42° 56' 01"	71° 59' 12"
Kitt Peak, AZ	31° 57' 23"	111° 36' 45"
Los Alamos, NM	35° 46' 31"	106° 14' 44"
Mauna Kea, HI	19° 48' 05"	155° 27' 19"
North Liberty, IA	41° 46' 17"	91° 34' 27"
Owens Valley, CA	37° 13' 54"	118° 16' 37"
Pie Town, NM	34° 18' 04"	108° 07' 09"
Saint Croix, VI	17° 45' 24"	64° 35' 01"

**Amendment to Part 101 of title 47 of the Code of Federal Regulations is proposed as follows:**

**PART 101 – FIXED MICROWAVE SERVICES**

**§ 101.101 Frequency Availability**

Frequency band (MHz)	Radio Service				
	Common carrier (Part 101)	Private radio (Part 101)	Broadcast auxiliary (Part 74)	Other (Parts 15, 21, 22, 24, 25, 74, 78 & 100)	Notes
*	*	*	*	*	**
71,000-76,000	CC.....	OFS.....	.....	.....	F/M/TF
81,000-86,000	CC.....	OFS.....	.....	.....	F/M/TF
92,300-93,200	CC.....	OFS.....	.....	.....	F/M/TF.
94,100-95,000	CC.....	OFS.....	.....	.....	F/M/TF.

**§ 101.113 Transmitter power limitations**

(a) \* \* \* \* \*

Frequency band (MHz)	Maximum Allowable EIRP	
	Fixed (dBW)	Mobile (dBW)
*	*	*****
71,000-76,000	+55	+55
81,000-86,000	+55	+55
92,300-93,200	+55	+55
94,100-95,000	+55	+55

**§101.115 Directional antennas**

- (c) Fixed stations (other than temporary fixed stations and DEMS nodal stations) operating at 932.5 MHz or higher must employ transmitting and receiving antennas (excluding second receiving antennas for operations such as space diversity) meeting the appropriate performance Standard A indicated below, except that in areas not subject to frequency congestion, antennas meeting

performance Standard B may be used, subject to the requirements set forth in paragraph (d) of this section. Licensees shall comply with the antenna standards table shown in this paragraph in the following manner:

- (1) With either the maximum beamwidth to 3 dB points requirement or with the minimum antenna gain requirement; and
- (2) With the minimum radiation suppression to angle requirement.

#### ANTENNA STANDARDS

Frequency (MHz)	Cat	Maximum beamwidth to 3 dB points (Included angle in degrees)	Minimum antenna gain (dBi)	Minimum radiation suppression to angle in degrees from centerline of main beam in decibels						
				5° to 10°*	10° to 15°*	15° to 20°*	20° to 30°*	30° to 100°*	100° to 140°*	140° to 180°*
932.5 to 935	A	14.0	n/a	n/a	6	11	14	17	20	24
	B	20.0	n/a	n/a	n/a	6	10	13	15	20
...										
38,600 to 40,000	A	n/a	38	25	29	33	36	42	55	55
	B	n/a	38	20	24	28	32	35	36	36
71,000 to 76,000	A	0.60†	50‡	*L <sub>1</sub>	36	40	45	50	55	55
	B	0.60†	50‡		33	36	39	42	45	45
81,000 to 86,000	A	0.60†	50‡	*L <sub>1</sub>	36	40	45	50	55	55
	B	0.60†	50‡		33	36	39	42	45	45

† For antenna gain < 50 dBi, maximum authorized beamwidth in degrees increases to  $0.60 \times 10^{(50 - G)/20}$ , subject also to added constraints on power described below.

‡ Antenna gain less than 50 dBi is permitted with a proportional reduction in maximum authorized transmitter power in a ratio of 2 dB of power per 1 dB of gain, so that the maximum allowable EIRP (in dBW) for antennas of less than 50 dBi gain becomes  $+55 - 3 (50 - G)$ , where G is the antenna gain in dBi.

\* For the bands 71-76 GHz and 81-86 GHz, the following specification is included for minimum radiation suppression L<sub>1</sub> at angles from 1° to 5° from centerline of main beam in dB:  $30 + (1/2)(G - 50)$ ;  $G \geq 50$  dBi;  $30 + (12/7)(G - 50)$ ;  $G < 50$  dBi. The Commission recognizes that high levels of radiation suppression are difficult to achieve so close to the main beam, and agrees to allow a variance from this standard in return for a proportional reduction in transmitter power, in a ratio of 2 dB per dB of variance:  $EIRP = +55 - 2 (L - L_1)$ . The measured radiation suppression level L will apply to a class of antennas based on 9 of 10 antennas meeting or exceeding this value on measurements of ten random samples from a single production run. This power reduction is in addition to any reduction that may apply independently for antennas with gain of less than 50 dBi.

#### § 101.147 Frequency assignments

(a) \* \* \* \* \*

71,000-76,000 MHz \4\ \5\ \11\ \17\ \19\  
81,000-86,000 MHz \4\ \5\ \11\ \17\ \19\

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92,300-93,200 MHz \17\  
94,100-95,000 MHz \17\

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